(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 221 570 B2

(12) **NEW EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the opposition decision:
04.10.2000 Bulletin 2000/40

(45) Mention of the grant of the patent:
30.01.1991 Bulletin 1991/05

(21) Application number: **86115473.0**

(22) Date of filing: **07.11.1986**

(51) Int. Cl.[7]: **A61F 2/04**

(54) **Expandable intraluminal graft, and apparatus for implanting an expandable intraluminal graft**

Ausbreitbares intraluminales Gewebe und Gerät zum Implantieren dieses ausbreitbaren intraluminalen Gewebes

Greffe extensible intraluminaire et dispositif pour implanter celle-ci

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(30) Priority: **07.11.1985 US 796009**

(43) Date of publication of application:
13.05.1987 Bulletin 1987/20

(73) Proprietor: **Palmaz, Julio C.**
San Antonio Texas 78230 (US)

(72) Inventor: **Palmaz, Julio C.**
San Antonio Texas 78230 (US)

(74) Representative:
UEXKÜLL & STOLBERG
Patentanwälte
Beselerstrasse 4
22607 Hamburg (DE)

(56) References cited:
WO-A-83/03752
US-A- 3 657 744
US-A- 4 553 545
US-A- 4 580 568

EP 0 221 570 B2

Description

[0001] The invention relates to an expandable intraluminal graft or prosthesis, for a body passageway, comprising: a tubular shaped member having first and second ends and a wall surface disposed between the first and second ends, the wall surface being formed by a plurality of first and second intersecting elongate members, at least some of the first elongate members intersecting with some of the second elongate members intermediate the first and second ends of the tubular shaped member, the tubular shaped member having a first diameter which permits intraluminal delivery of the tubular shaped member into a body passageway having a lumen, and the tubular shaped member having a second expanded diameter which is determined by the application from the interior of the tubular shaped member of a radially, outwardly extending force, which second diameter is variable and controlled by the amount of force applied to the tubular shaped member, at least some of the elongate members being deformed by the radially, outwardly extending force, to retain the tubular shaped member with the second expanded diameter, whereby the tubular shaped member may be expanded to expand the lumen of the body passageway and remain therein. and to an apparatus for implanting an expandable intraluminal graft or prosthesis according to the preamble of claim 3.

[0002] Intraluminal endovascular grafting has been demonstrated by experimentation to present a possible alternative to conventional vascular surgery. Intraluminal endovascular grafting involves the percutaneous insertion into a blood vessel of a tubular prosthetic graft and its delivery via a catheter to the desired location within the vascular system. Advantages of this method over conventional vascular surgery include obviating the need for surgically exposing, incising, removing, replacing, or bypassing the defective blood vessel.

[0003] In US-A-4553545 a helically shaped spiral spring is disclosed for application in blood vessels. Those prior art grafts can generally be classified as self-expanding wires, wherein the graft, after having delivered to a stenotic site and released, is subjected to a spring or spring-like force associated with the construction of such grafts to cause the graft to enlarge and open outwardly within the body passageway.

[0004] Some of the structures which have previously been used as intraluminal vascular grafts have included coiled stainless steel springs; helically would coil springs manufactured from an expandable heat-sensitive material; and expanding stainless steel stents formed of stainless steel wire in a zig-zag pattern. In general, the foregoing structures have one major disadvantage in common. Insofar as these structures must be delivered to the desired location within a given body passageway in a collapsed state, in order to pass through the body passageway, there is no effective control over the final, expanded configuration of each structure. For example, the expansion of a particular coiled spring-type graft is predetermined by the spring constant and modulus of elasticity of the particular material utilized to manufacture the coiled spring structure. These same factors predetermine the amount of expansion of collapsed stents formed of stainless steel wire in a zig-zag pattern. In the case of intraluminal grafts, or prostheses, formed of a heat sensitive material which expands upon heating, the amount of expansion is likewise predetermined by the heat expansion characteristics of the particular alloy utilized in the manufacture of the intraluminal graft.

[0005] Thus, once the foregoing types of intraluminal grafts are expanded at the desired location within a body passageway, such as within an artery or vein, the expanded size of the graft cannot be changed. If the diameter of the desired body passageway has been miscalculated, an undersized graft might not expand enough to contact the interior surface of the body passageway, so as to be secured thereto. It may then migrate away from the desired location within the body passageway. Likewise, an oversized graft might expand to such an extent that the spring force, or expansion force, exerted by the graft upon the body passageway could cause rupturing of the body passageway.

[0006] Another alternative to conventional vascular surgery has been percutaneous balloon dilation of elastic vascular stenoses, or blockages, through use of a catheter mounted angioplasty balloon. In this procedure, the angioplasty balloon is inflated within the stenosed vessel, or body passageway, in order to shear and disrupt the wall components of the vessel to obtain an enlarged lumen. With respect to arterial atherosclerotic lesions, the relatively incompressible plaque remains unaltered, while the more elastic medial and adventitial layers of the body passageway stretch around the plaque. This process produces dissection, or a splitting and tearing, of the body passageway wall layers, wherein the intima, or internal surface of the artery or body passageway, suffers fissuring. This dissection forms a "flap" of underlying tissue which may reduce the blood flow through the lumen, or block the lumen. Typically, the distending intraluminal pressure within the body passageway can hold the disrupted layer or flap, in place. If the intimal flap created by the balloon dilation procedure is not maintained in place against the expanded intima, the intimal flap can fold down into the lumen and close off the lumen, or may even become detached and enter the body passageway. When the intimal flap closes off the body passageway, immediate surgery is necessary to correct this problem.

[0007] Although the balloon dilation procedure is typically conducted in the catheterization lab of a hospital, because of the foregoing problem, it is always necessary to have a surgeon on call should the intimal flap block the blood vessel or body passageway. Further, because of the possibility of the intimal flap tearing away

from the blood vessel and blocking the lumen, balloon dilations cannot be performed upon certain critical body passageways, such as the left main coronary artery, which leads into the heart. If an intimal flap formed by a balloon dilation procedure abruptly comes down and closes off a critical body passageway, such as the left main coronary artery, the patient could die before any surgical procedures could be performed.

[0008] Additional disadvantages associated with balloon dilation of elastic vascular stenoses is that many fail because of elastic recoil of the stenotic lesion. This usually occurs due to a high fibrocollagenous content in the lesion and is sometimes due to certain mechanical characteristics of the area to be dilated. Thus, although the body passageway may initially be successfully expanded by a balloon dilation procedure, subsequent, early restenosis can occur due to the recoil of the body passageway wall which decreases the size of the previously expanded lumen of the body passageway. For example, stenoses of the renal artery at the ostium are known to be refractory to balloon dilation because the dilating forces are applied to the aortic wall rather than to the renal artery itself. Vascular stenoses caused by neointimal fibrosis, such as those seen in dialysis-access fistulas, have proved to be difficult to dilate, requiring high dilating pressures and larger balloon diameters. Similar difficulties have been observed in angioplasties of graft-artery anastomotic strictures and postendarterectomy recurrent stenoses. Percutaneous angioplasty of Takayasu arteritis and neurofibromatosis arterial stenoses may show poor initial response and recurrence which is believed due to the fibrotic nature of these lesions.

[0009] From the article "Expandable Intraluminal Grafts: A Preliminary Study", Palmaz et al., Radiology, Vol. 156 No. 1, July 1985, pp. 73-77, a graft comprising all features of the pre-characterizing portion of claim 1 is known. This graft is formed by a plurality of intersecting wires which are woven and soldered at each wire intersection. This graft is schematically shown in Figures 1A and 1B, and will be described in more detail below.

[0010] From US 3,657,744 another tubular implant structure is known which comprises the features of the pre-characterising portion of claim 1.

[0011] In this document a different expandable tubular-shaped sleeve is described which is to be inserted and delivered to a desired location within the lumen of a body passageway. The tubular-shaped sleeve is made from a metal sheeting by forming at first a series of staggered parallel slits in a metal sheet. Then, the metal sheet is stretched in a direction perpendicular to the slits to cause the slits to open in diamond-shaped apertures uniformly sized and distributed. The expanded metal sheet is then formed into a sleeve which is spot welded to form a longitudinal seam. From this state the sleeve may be still further expanded by using an expansion tool.

[0012] It is the object of the present invention to provide an expandable graft having a wide expansion capability, which can be easily inserted and delivered in place and, at the same time, which can be expanded to a variable and controlled size to prevent migration of the graft away from the desired location.

[0013] This object is solved in that the first and second intersecting elongate members are a plurality of thin bars, each having a uniform thin rectangular cross-sectional configuration, wherein each pair of adjacent first bars is interconnected by at least two of said second bars, each second bar being formed integral with the respective pair of first bars and extending only between said pair of first bars and each second bar extending on the circumference of a circle whose plane is perpendicular to the longitudinal axis of said tubular shaped member.

[0014] The present invention, provides an expandable intraluminal vascular graft, and apparatus for expanding the lumen of a body passageway, which: prevents recurrence of stenoses in the body passageway; can be utilized for critical body passageways, such as the left main coronary artery of a patient's heart; prevents recoil of the body passageway wall; and allows the intraluminal graft to be expanded to a variable size to prevent migration of the graft away from the desired location; and to prevent rupturing of the body passageway by the expanded graft. A further feature of the present invention is that the tubular shaped member may have a biological intert coating on its wall surface, and the coating may include a means for anchoring the tubular shaped member to the body passageway.

[0015] The graft of the present invention is applied performing the steps of: inserting an intraluminal graft, disposed upon a catheter, into the body passageway until it is disposed adjacent a desired location within the body passageway; and expanding a portion of the catheter to cause the intraluminal graft to radially expand outwardly into contact with the body passageway until the lumen of the body passageway at the desired location of the body passageway has been expanded, whereby the intraluminal graft prevents the body passageway from collapsing and decreasing the size of the expanded lumen.

[0016] Then the portion of the catheter in contact with the intraluminal graft may be collapsed, and the catheter removed from the body passageway. In connection with the present invention a catheter having an expandable, inflatable portion associated therewith may be utilized; and expansion of the intraluminal graft and the portion of the catheter is accomplished by inflating the expandable, inflatable portion of the catheter.

[0017] In accordance with the invention, the foregoing advantages have also been achieved through the present apparatus for intraluminally reinforcing a body passageway in accordance with the features of claim 3. In a preferred embodiment of the present invention the mounting and retaining means may comprise a retainer ring member disposed on the catheter adjacent the

expandable, inflatable portion and adjacent each end of the expandable, tubular shaped prosthesis.

BRIEF DESCRIPTION OF THE DRAWINGS:

[0018] In the drawings:

FIG. 1A is a perspective view of an expandable intraluminal vascular graft, or prosthesis for a body passageway, of the prior art having a first diameter which permits delivery of the graft, or prosthesis, into a body passageway;

FIG. 1B is a perspective view of the graft, or prosthesis, of FIG. 1A, in its expanded configuration when disposed within a body passageway;

FIG. 2A is a perspective view of an embodiment of an expandable intraluminal vascular graft, or prosthesis for a body passageway in accordance with the invention having a first diameter which permits intraluminal delivery of the graft, or prosthesis, into a body passageway; and

FIG. 2B is a perspective view of the graft, or prosthesis, of FIG. 2A, shown in its expanded configuration when disposed within a body passageway.

[0019] While the invention will be described in connection with the preferred embodiment, it will be understood that it is not intended to limit the invention to that embodiment. On the contrary, it is intended to cover all alternatives, modifications, and equivalents, as may be included within the scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION:

[0020] In FIGS. 1A and 2A, an expandable intraluminal vascular graft, or expandable prosthesis for a body passageway, 70 according to the prior art and according to the present invention, respectively, are illustrated. It should be understood that the terms "expandable intraluminal vascular graft" and "expandable prosthesis" are interchangeably used to some extent in describing the present invention, insofar as the apparatus, and structures of the present invention may be utilized not only in connection with an expandable intraluminal vascular graft for expanding partially occluded segments of a blood vessel, or body passageway, but may also be utilized for may other purposes as an expandable prosthesis for many other types of body passageways. For example, expandable prostheses 70 may also be used for such purposes as: (1) supportive graft placement within blocked arteries opened by transluminal recanalization, but which are likely to collapse in the absence of an internal support; (2) similar use following catheter passage through mediastinal and other veins occluded by inoperable cancers; (3) reinforcement of cathether created intrahepatic communications between portal and hepatic veins in patients suffering from portal hypertension; (4) supportive graft placement of narrowing of the esophagus, the intestine, the ureters, the urethra; and (5) supportive graft reinforcement of reopened and previously obstructed bile ducts. Accordingly, use and the term "prosthesis" emcompasses the foregoing usages within various types of body passageways, and the use of the term "intraluminal vascular graft" encompasses use for expanding the lumen of a body passageway. Further, in this regard, the term "body passageway" emcompasses any duct within the human body, such as those previously described, as well as any vein, artery, or blood vessel within the human vascular system.

[0021] With with reference to FIG. 1A, the expandable intraluminal vascular graft, or prosthesis, 70 of the prior art is shown to generally comprise a tubular shaped member 71 having first and second ends 72, 73 and a wall surface 74 disposed between the first and second ends 72, 73. The wall surface 74 is formed by a plurality of intersecting elongate members 75, 76 with at least some of the elongate members 75, 76 intersecting with one another intermediate the first and second ends 72, 73 of the tubular shaped member 71, such as shown at intersection points 77. Tubular shaped member 71 has a first diameter, d, which, to be hereinafter described in greater detail, permits intraluminal delivery of the tubular shaped member 71 into a body passageway having a lumen. With reference to FIG. 1B, upon the application from the interior of the tubular shaped member 71 of a radially, outwardly extending force, to be hereinafter described in greater detail tubular shaped member 71 has a second, expanded diameter, d', which second diameter d' is variable in size and dependent upon the amount of force applied to the tubular shaped member 71.

[0022] Elongate members 75, 76 must also be made of a material which has the requisite strength and elasticity characteristics to permit the tubular shaped membr 71 to be expanded from the configuration shown in FIG. 1A to the configuration shown illustrated in FIG. 1B and further to permit the tubular shaped member 71 to retain its expanded configuration with the enlarged diameter d' shown in FIG. 1B. In the known prosthesis elongate members 75, 76 were fabricated from stainless steel. The elongate members 75, 76 illustrated in FIGS. 1A and 1B are small diameter stainless steel wires having a cylindrical cross-section. The plurality of elongate members 75, 76 are fixedly secured to one another where the elongate members 75, 76 intersect with one another, such as at the intersection points 77. Elongate members 75, 76 are fixedly secured to one another by soldering, with silver. By fixedly securing the elongate members 75, 76, to one another, tubular member 71 is provided with a relatively high resistance to radial collapse, and the tubular shaped member 71 has the ability to retain its enlarged diameter, d', as shown in FIG. 1B. The tubular shaped member 71 is made of continuous, stainless steel wire woven in a criss-

crossed tubular pattern to form what can be generally described as a wire mesh tube.

[0023] When fabricating tubular shaped member, or wire mesh tube, 71, it can be initially fabricated in the configuration shown in FIG. 1A with diameter, d. Alternatively, it can be fabricated with a diameter which is larger than initial diameter d and after fabrication, tubular shaped member 71 could be carefully collapsed to have diameter d shown in FIG. 1A. During the collapsing of tubular shaped member, or wire mesh tube, 71, care must be taken to insure that overlapping of adjacent elongate member 75, 76 is avoided. It should of course be understood that upon expansion of tubular shaped member, or wire mesh tube, 71 into the configuration shown in FIG. 1B, the distance between first and second ends 72 and 73 will of course decrease.

[0024] With reference now to FIGS. 2A and 2B, an embodiment of expandable intraluminal vascular graft, or prosthesis, 70 in accordance with the present invention is illustrated. The same reference numerals are utilized and are applicable for elements previously described in FIGS. 1A and 1B. The intraluminal vascular graft, or prosthesis, 70 of FIGS. 2A and 2B differs from that previously described in connection with FIGS. 1A and 1B, in that the plurality of elongate members 75 and 76 are a plurality of thin bars 78, 79. Bars 78, 79 have a thin, rectangular cross-sectional configuration, and formed integral with one another. Preferably, tubular shaped member 71 is initially a thin-walled stainless steel tube, and the openings 82 between the intersecting bars 78 and 79 are formed by a conventional etching process, such as electromechanical or laser etching, whereby the resultant structure is a tubular shaped member 71 having a plurality of intersecting elongate members 78, 79. The tubular shaped member can also be made of a material comprising tantalum as a main component. The embodiment of graft, or prosthesis, 70 of FIG. 2A, likewise can assume an expanded configuration as shown in FIG. 2B and as previously described in connection with FIG. 1B, upon the application from the interior of the tubular shaped member 71 of a radially, outwardly extending force.

[0025] The apparatus of the present invention will be described in greater detail. Once again, it should be understood that the apparatus of the present invention is useful not only for expanding the lumen of a body passageway, such as an artery, vein, or blood vessel of the human vascular system, but is also useful to perform the previously described procedures to intraluminally reinforce other body passageways or ducts, as previously described. An expandable intraluminal vascular graft, or prosthesis, 70, which may be of the type previously described in connection with FIG. 2A, is disposed or mounted upon a catheter. The catheter has an expandable, inflatable portion associated therewith. The catheter includes means for mounting and retaining the expandable intraluminal vascular graft, or prosthesis, 70 on the expandable, inflatable portion of said catheter. Preferably, the mounting and retaining means comprises retainer ring members disposed on the catheter adjacent the expandable inflatable portion of the catheter ; and a retainer ring member is disposed adjacent each end 72, 73 of the expandable intraluminal vascular graft, or prosthesis, 70. Preferably, while retainer ring members are formed integral with the catheter, and the retainer ring member adjacent the leading tip of said catheter slopes upwardly and away from said catheter tip in order to protect and retain graft or prosthesis, 70 as it is inserted into the lumen of body passageway, as to be hereinafter described in greater detail. The remaining retainer ring member slopes downwardly away from the tip of said catheter, to insure easy removal of said catheter from body passageway. After expandable intraluminal graft, or prosthesis, 70 has been disposed upon said catheter, in the manner previously described, the graft, or prosthesis, 70 and said catheter are inserted within a body passageway by catheterization of the body passageway in a conventional manner.

[0026] In a conventional manner, the catheter and graft, or prosthesis, 70 are delivered to the desired location within the body passageway, whereat it is desired to expand the lumen of said body passageway via intraluminal graft 70, or where it is desired to implant prosthesis 70. Fluoroscopy, and/or other conventional techniques may be utilized to insure that the catheter and graft, or prosthesis, 70 are delivered to the desired location within the body passageway. Prosthesis, or graft, 70 are then expanded by expanding the expandable, inflatable portion of said catheter whereby the prosthesis, or graft, 70 is forced radially, outwardly into contact with the body passageway.In this regard, the expandable, inflatable portion of catheter may be a conventional angioplasty balloon. After the desired expansion of prosthesis, or graft, 70 has been accomplished, said angioplasty balloon may be collapsed, or deflated, and the catheter may be removed in a conventional manner from the body passageway. If desired, the catheter, having graft or prosthesis, 70 disposed thereon, may be initially encased in a conventional Teflon™ sheath, which is pulled away from prosthesis, or graft, 70, prior to expansion of the prosthesis, or graft, 70.

[0027] It should be noted that the tubular shaped member 71 of prosthesis, or graft, 70 initially has the first predetermined, collapsed diameter d as described in connection with FIG. 2A, in order to permit the insertion of the tubular shaped member, 71 into the body passageway as previously described. When it is desired to implant prosthesis 70 within a body passageway for the purposes previously described, the prosthesis 70, is expanded to the second diameter d' and the second, expanded diameter d' is variable and determined by the internal diameter of the body passageway. Accordingly, the expanded prosthesis 70, upon deflation of the angioplasty balloon will not be able to migrate from the desired location within the body passageway, nor will

the expansion of the prosthesis 70 be likely to cause a rupture of the body passageway.

[0028] When it is desired to use expandable intraluminal graft 70 to expand the lumen of a body passageway having an area of stenosis, the expansion of intraluminal vascular graft 70 by angioplasty balloon, allows controlled dilation of the stenotic area and, at the same time controlled expansion of the vascular graft 70, whereby vascular graft 70 prevents the body passageway from collapsing and decreasing the size of the previously expanded lumen. Once again, the second, expanded diameter d' of intraluminal vascular graft 70, is variable and determined by the desired expanded internal diameter of the body passageway. Thus, the expandable intraluminal graft 70 will not migrate away from the desired location within the body passageway upon deflation of the angioplasty balloon, nor will the expansion of intraluminal graft 70 likely cause a rupture of the body passageway. Further, should an intimal flap, or fissure, be formed in the body passageway at the location of graft 70, graft 70 will insure that such an intimal flap will not be able to fold inwardly into the body passageway, nor tear loose and flow through the body passageway. In the situation of utilizing graft 70 in the manner previously described to expand the lumen of a portion of the left main artery, it is believed that the intimal flap will be unable to enter the heart and cause the death of the patient.

[0029] Because it is only necessary to inflate said angioplasty balloon one time in order to expand graft 70, it is believed that a greater amount of endothelium, or inner layer of the intima, or inner surface of the body passageway, will be preserved, insofar as the extent of endothelial denudation during transluminal angioplasty is proportional to the balloon inflation time. Further, in theory, the amount of preserved endothelium should be large because in the expanded configuration of graft 70, potentially 80% of the endothelium is exposed through openings 82 of graft 70. If is further believed that intact patches of endothelium between the elongate members 75, 76, 78, 79 of graft 70 may result in a rapid, multicentric endothelialization pattern as shown by experimental studies.

[0030] It is to be understood that the invention is not limited to the exact details of construction, operation, exact materials or embodiment shown and described, as obviously modifications and equivalents will be apparent to one skilled in the art. For example, the means for expanding the prosthesis or graft could be a plurality of hydraulically actuated rigid members disposed on a catheter, or a plurality of angioplasty balloons could be utilized to expand the prosthesis or graft. Accordingly, the invention is therefore to be limited only by the scope of the appended claims.

Claims

1. An expandable intraluminal vascular graft or prosthesis (70) for a body passageway, comprising: a tubular shaped member (71) having first (72) and second (73) ends and a wall surface (74) disposed between the first and second ends, the wall surface (74) being formed by a plurality of first and second intersecting elongate members (78, 79), at least some of the first elongate members (78) intersecting with some of the second elongate members (79) intermediate the first and second ends of the tubular shaped member (71), the tubular shaped member (71) having a first diameter (d) which permits intraluminal delivery of the tubular shaped member into a body passageway having a lumen, and the tubular shaped member (71) having a second expanded diameter (d') which is determined by the application from the interior of the tubular shaped member (71) of a radially, outwardly extending force, which second diameter (d') is variable and controlled by the amount of force applied to the tubular shaped member (71), at least some of the elongate members (78, 79) being deformed by the radially, outwardly extending force, to retain the tubular shaped member (71) with the second expanded diameter (d'), whereby the tubular shaped member (71) may be expanded to expand the lumen of the body passageway and remain therein,
characterized
in that the first and second intersecting elongate members (78, 79) are a plurality of thin bars, each having a uniform thin rectangular cross-sectional configuration, wherein each pair of adjacent first bars (78) is interconnected by at least two of said second bars (79), each second bar (79) being formed integral with the respective pair of first bars (78) and extending only between said pair of first bars (78) and each second bar (79) extending on the circumference of a circle whose plane is perpendicular to the longitudinal axis of said tubular shaped member (71).

2. The graft or prosthesis of claim 1, wherein the material of said elongate members (78, 79) comprises tantalum as a main component.

3. An apparatus for intraluminally reinforcing or expanding the lumen of a body passageway, comprising an expandable, tubular shaped prosthesis or intraluminal vascular graft (70) according to one of the preceding claims and a catheter for mounting the prosthesis or graft (70),
characterized
in that the catheter has an expandable, inflatable portion associated therewith and including means for mounting and retaining the expandable, tubular shaped prosthesis or intraluminal vascular graft (70) on the expandable, inflatable portion, whereby upon inflation of the expandable, inflatable portion

of the catheter, the prosthesis (70) is forced radially outwardly into contact with the body passageway to remain therein, and the expansion of the prosthesis (70) is controlled by the expansion of the inflatable portion of the catheter.

4. The apparatus of claim 3, wherein the mounting and retaining means comprises retainer ring members disposed on the catheter adjacent the expandable, inflatable portion and adjacent each end of the expandable, tubular shaped prosthesis.

Patentansprüche

1. Aufweitbares intraluminales vaskuläres Transplantat bzw. Prothese (70) für einen Körperdurchgang, mit: einem rohrförmigen Element (71) mit einem ersten Ende (72) und einem zweiten Ende (73) und einer zwischen dem ersten und dem zweiten Ende angeordneten Wandfläche (74), die aus einer Anzahl von sich kreuzenden ersten und zweiten länglichen Gliedern (78, 79) gebildet ist, wobei sich zumindest einige der ersten länglichen Glieder (78) mit einigen der zweiten länglichen Glieder (79) zwischen dem ersten und dem zweiten Ende des rohrförmigen Elements (71) kreuzen, wobei das rohrförmige Element (71) einen ersten Durchmesser (d) aufweist, welcher die intraluminale Einführung des rohrförmigen Elementes in einen ein Lumen aufweisenden Körperdurchgang erlaubt, und wobei das rohrförmige Element (71) einen zweiten, aufgeweiteten Durchmesser (d') aufweist, der bestimmt ist durch die Anwendung einer vom Inneren des rohrförmigen Elementes (71) radial nach außen wirkenden Kraft, welcher zweite Durchmesser (d') variabel ist und durch den Betrag der auf das rohrförmige Element (71) aufgebrachten Kraft steuerbar ist, wobei zumindest einige der länglichen Glieder (78, 79) durch die radial nach außen wirkende Kraft deformiert werden, um das rohrförmige Element (71) mit dem zweiten aufgeweiteten Durchmesser (d') zu halten, wodurch das rohrförmige Element (71) expandiert werden kann, um das Lumen des Körperdurchgangs aufzuweiten, und darin verbleiben kann, dadurch gekennzeichnet,
daß die ersten und zweiten sich kreuzenden länglichen Glieder (78, 79) eine Anzahl dünner Stäbe sind, die jeweils eine gleichförmig dünne rechtekkige Querschnittskonfiguration haben, wobei jedes Paar benachbarter erster Stäbe (78) durch mindestens zwei der zweiten Stäbe (79) verbunden ist, wobei jeder zweite Stab (79) integral mit dem jeweiligen Paar erster Stäbe (78) gebildet ist und sich nur zwischen diesem Paar erster Stäbe (78) erstreckt, und wobei sich jeder zweite Stab (79) auf dem Umfang eines Kreises erstreckt, dessen Ebene senkrecht zur Längsachse des rohrförmigen Elementes (71) ist.

2. Transplantat oder Prothese nach Anspruch 1, wobei das Material der länglichen Glieder (78, 79) Tantal als eine Hauptkomponente aufweist.

3. Vorrichtung zum intraluminalen Verstärken oder Aufweiten des Lumens eines Körperdurchgangs, mit einer aufweitbaren, rohrförmigen Prothese oder einem intraluminalen vaskulären Transplantat (70) gemäß einem der vorhergehenden Ansprüche und einem Katheter zum Anbringen der Prothese oder des Transplantats (70),
dadurch gekennzeichnet,
daß der Katheter einen hiermit verknüpften aufweitbaren, aufpumpbaren Abschnitt hat und eine Einrichtung zum Anbringen und Halten der aufweitbaren, rohrförmigen Prothese bzw. des aufweitbaren, rohrförmigen intraluminalen vaskulären Transplantats (70) auf dem aufweitbaren, aufpumpbaren Abschnitt aufweist, wodurch beim Aufpumpen des aufweitbaren, aufpumpbaren Abschnitts des Katheters die Prothese (70) radial nach außen in Kontakt mit dem Körperdurchgang gedrückt wird, um darin zu verbleiben, und wobei die Aufweitung der Prothese (70) durch das Aufweiten des aufpumpbaren Abschnitts des Katheters gesteuert wird.

4. Vorrichtung nach Anspruch 3, wobei die Einrichtung zum Anbringen und Halten Halteringelemente aufweist, die auf dem Katheter angrenzend an den aufweitbaren, aufpumpbaren Abschnitt und angrenzend an die jeweiligen Enden der aufweitbaren, rohrförmigen Prothese angeordnet sind.

Revendications

1. Greffe ou prothèse vasculaire intraluminaire expansible (70) pour un passage dans un corps, comportant: un élément (71) de forme tubulaire présentant une première (72) et une seconde (73) extrémités et une surface de paroi (74) disposée entre la première et la seconde extrémités, la surface de paroi (74) étant formée par une pluralité de premiers et seconds éléments allongés (78, 79) qui s'intersectent, au moins certains des premiers éléments allongés (78) s'intersectant avec certains des seconds éléments allongés (79) entre la première et la seconde extrémités de l'élément (71) de forme tubulaire, l'élément (71) de forme tubulaire présentant un premier diamètre (d) qui permet de mettre en place, de façon intraluminaire, l'élément de forme tubulaire dans un passage du corps présentant une section de passage, et l'élément (71) de forme tubulaire, présentant un second diamètre dilaté (d'), qui est déterminé par l'application, par l'intérieur de l'élément (71) de forme tubulaire,

d'une force s'étendant radialement vers l'extérieur, ledit second diamètre (d') étant variable et contrôlé par la valeur de la force appliquée à l'élément (71) de forme tubulaire ; au moins certains des éléments allongés (78, 79) étant déformés par la force qui est exercée radialement vers l'extérieur pour maintenir à l'élément (71) de forme tubulaire son second diamètre dilaté (d'), ce par quoi l'élément (71) de forme tubulaire peut se dilater pour dilater la section du passage du corps et s'y maintenir,
caractérisée par le fait que les premiers et seconds éléments allongés (78, 79) qui s'intersectent sont une pluralité de fines barrettes, présentant chacune une configuration de section droite rectangulaire, fine et uniforme et dans laquelle chaque paire de premières barrettes adjacentes (78) est reliée par au moins deux desdites secondes barrettes (79), chaque seconde barrette (79) étant d'une pièce avec la paire respective de premières barrettes (78) et ne s'étendant qu'entre ladite paire de premières barrettes, chaque seconde barrette (79) s'étendant sur la circonférence d'un cercle dont le plan est perpendiculaire à l'axe longitudinal dudit élément de forme tubulaire.

2. Greffe ou prothèse selon la revendication 1, dans laquelle le matériau desdits éléments allongés (75, 76) comporte du tantale comme composant principal.

3. Dispositif pour renforcer ou dilater de façon intraluminaire la section d'un passage d'un corps comportant une prothèse ou greffe vasculaire intraluminaire (70), de forme tubulaire, expansible selon l'une des revendications précédentes ainsi qu'un cathéter pour monter la prothèse ou greffe (70)
caractérisé par le fait que le cathéter présente une portion gonflable, expansible, associée avec lui et incluant des moyens pour monter et maintenir la prothèse, ou greffe vasculaire, intraluminaire expansible de forme tubulaire sur la portion gonflable expansible, ce par quoi, lors du gonflage de la portion gonflable expansible du cathéter, la prothèse (70) est forcée, radialement vers l'extérieur, à venir en contact avec le passage du corps pour s'y maintenir ; et par le fait que l'expansion de la prothèse (70) est contrôlée par l'expansion de la portion gonflable du cathéter.

4. Dispositif selon la revendication 3, dans lequel les moyens de montage et de maintien comportent des éléments annulaires de maintien disposés sur le cathéter prés de la portion gonflable, expansible, et près de chaque extrémité de la prothèse de forme tubulaire, expansible.

Fig. 1A

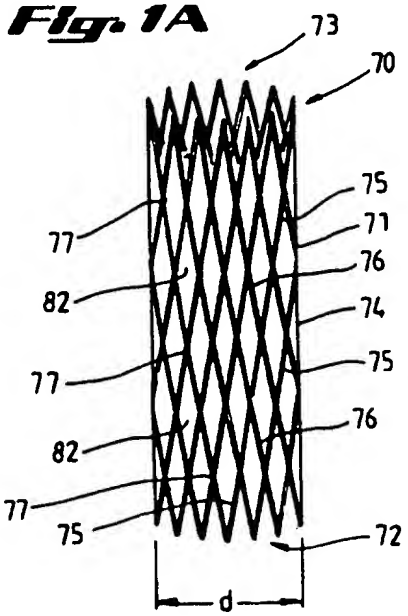

Fig. 1B

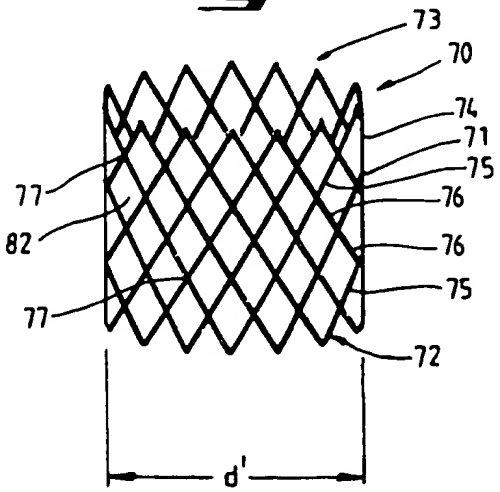

Fig. 2A

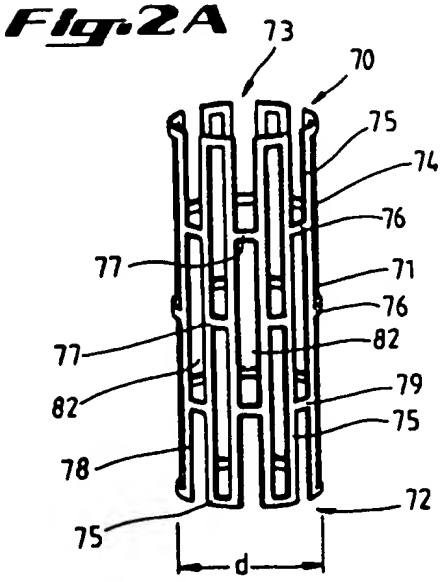

Fig. 2B